

Patent Claims

1. Process for the production of finely particulate, inorganic solids by precipitation of the finely particulate inorganic solids from solution, characterised in that the surface of the inorganic solids particles is covered (coated) with at least one additive, in which the additive(s) contains a dispersing agent or deflocculating agent, in which the proportion of the additive(s) overall is at most 80 wt.% of the coated solids, and in which the additive(s) is added to the starting solution or solutions.
2. Process according to claim 1, characterised in that the proportion of the additives is overall at most 40 wt.%.
3. Process according to claim 1, characterised in that the proportion of the additives is overall at most 30 wt.%.
4. Process according to one of claims 1 to 3, characterised in that the precipitation is carried out by combined addition of at least two starting solutions or by passing gas into a starting solution or by a hydrothermal treatment of a starting solution.
5. Process according to one of claims 1 to 4, characterised in that members of the following groups of substances are used as finely particulate, inorganic solids:
metal oxides and/or metal hydroxides, such as e.g. titanium dioxide, hydrated titanium oxide, zinc oxide/hydroxide, iron oxides/hydroxides, magnesium oxide/hydroxide, silicon dioxide/hydroxide,

- aluminium oxide/hydroxide, zirconium oxide/hydroxide;
metal carbonates and/or metal hydrogen carbonates, such as e.g. precipitated calcium carbonate, barium carbonate, lithium carbonate, strontium carbonate;
5 metal sulfates, such as e.g. barium sulfate, precipitated calcium sulfate;
metal sulfides, such as e.g. zinc sulfide, cadmium sulfide, iron sulfide, tin sulfide;
10 metal phosphates and/or metal hydrogen phosphates, such as e.g. zinc phosphate, aluminium phosphate, aluminium hydrogen phosphate, titanium phosphate, silicon aluminium phosphate;
metal titanates, such as e.g. barium titanate, strontium titanate, calcium titanate;
15 synthetic compounds of hydrotalcite structure; zirconates, silicates, aluminates, vanadates, compounds of all the aforementioned classes of substances in undoped or doped form, individually
20 or as a mixture.
6. Process according to one of claims 1 to 4, characterised in that members of the following
25 substances and groups of substances are used as finely particulate, inorganic solids: antimony oxide, chromium oxide, metal nitrates, metal halides, nickel titanate, lithium titanate, metal ferrites, such as e.g. barium ferrite, manganese ferrite, nickel ferrite; mixed oxides with a spinel
30 structure such as e.g. spinel green (Co,Ni,Zn)₂TiO₄, zinc/iron brown (ZnFe₂O₄); molybdates, borates; compounds of all the aforementioned substances and classes of substances in undoped or doped form, individually or as a mixture.
35
7. Process according to one of claims 1 to 6, characterised in that the dispersing agent or

- deflocculating agent contains one or more of the following substances: alkali metal salts or ammonium salts of organic acids (e.g. salts of poly(meth)acrylic acid), alkali metal salts or ammonium salts of acrylate copolymers or methacrylate copolymers, polyphosphates (inorganic or organic polyphosphates, potassium tetrapolyphosphate, poly(meth)acrylate phosphates, aliphatic polyether phosphates), generally poly(meth)acrylates, polyethers, anionically modified polyethers, fatty alcohol polyglycol ethers, modified polyurethanes, non-ionic, modified fatty acid derivatives or anion-active aliphatic esters.
- 5
- 10
- 15
8. Process according to one of claims 1 to 7, characterised in that the added amount of the dispersing agent or deflocculating agent is 0.01 to 40 wt.%, referred to the finished coated product.
- 20
9. Process according to claim 8, characterised in that the added amount of the dispersing agent or deflocculating agent is 0.01 to 30 wt.%, referred to the finished coated product.
- 25
10. Process according to one of claims 1 to 9, characterised in that a second additive, namely an organic additive, is added.
- 30
11. Process according to claim 10, characterised in that the second, organic additive contains one or more of the following substances: carboxylic acids, soaps, metal soaps, alcohols (e.g. 1,1,1-trimethylolpropane, di-trimethylolpropane, methylpropanediol, butylethylpropanediol, cyclotrimethylolpropane, trimethylpropane dialkyl ether), pentaerythritol, neopentyl glycol,
- 35

15

- polyalcohols (e.g. neopentyl glycol propoxylates, pentaerythritol ethoxylates), polyglycols (e.g. polyethylene glycol), polyethylene glycol ethers, organic esters (e.g. neopentyl glycol dibenzoate, silanes, siloxanes, silicone oils, organic sulfones of the formula RSO_2R , organic ketones $\text{R}-(\text{C}=\text{O})-\text{R}$, organic nitriles RCN , organic sulfoxides R_2-SO_2 , organic sulfonic acids (e.g. toluenesulfonic acid), alkali salts and ammonium salts of organic sulfonic acids (e.g. ammonium salt of p-toluenesulfonic acid), organic amides $\text{R}-(\text{C}=\text{O})-\text{NR}^1\text{R}$ (e.g. polyhydroxycarboxylic acid amides) or $\text{R}-(\text{S}=\text{O})-\text{ONR}^1\text{R}$, organic amines (e.g. triethanolamine), alkali salts or ammonium salts of organic phosphoric acid esters (e.g. alkylolammonium salts of acidic phosphoric acid esters), fatty acid esters or fatty acid amides.
12. Process according to one of claims 10 and 11, characterised in that the added amount of the second, organic additive is 0.01 to 60 wt.%, referred to the finished coated product.
13. Process according to claim 12, characterised in that the added amount of the second, organic additive is 0.01 to 40 wt.%, referred to the finished coated product.
14. Process according to claim 13, characterised in that the added amount of the second, organic additive is 0.1 to 20 wt.%, referred to the finished coated product.
15. Process according to one of claims 1 to 14, characterised in that in the precipitation of the inorganic solids a defoaming agent is added as further additive.

16. Process according to claim 15, characterised in that the added amount of the defoaming agent is up to 10 wt.%.
5
17. Process according to claim 15, characterised in that the added amount of the defoaming agent is up to 0.01 to 5 wt.%.
10
18. Process according to one of claims 1 to 17, characterised in that the coated, finely particulate, inorganic solids have a mean grain size d_{50} of 0.1 to 50 μm .
15
19. Process according to claim 17, characterised in that the coated, finely particulate, inorganic solids have a mean grain size d_{50} of 0.1 to 10 μm .
20
20. Process according to claim 17, characterised in that the coated, finely particulate, inorganic solids have a mean grain size d_{50} of 0.2 to 5 μm .
25
21. Process according to one of claims 1 to 17, characterised in that the coated, finely particulate, inorganic solids have a mean crystallite size of < 200 nm.
30
22. Process according to one of claims 1 to 17, characterised in that the coated, finely particulate, inorganic solids have a mean crystallite size of 1 to 120 nm.
35
23. Process according to one of claims 1 to 17, characterised in that the coated, finely particulate, inorganic solids have a mean crystallite size of 1 to 80 nm.

FRE/10/FEB/2006 13:19

FAX Nr. :069-7165-2331

P. 045/054

17

24. Use of the coated, finely particulate, inorganic solids produced by a process according to one of claims 1 to 23 as additive in plastics, in polymer production, in lacquers and colorants, in paper production, in ceramics, medicinal and cosmetic products, as well as in catalysis.
25. Use of the coated, finely particulate, inorganic solids produced by the process according to one of claims 1 to 23 in electronics, nanoelectronics, optoelectronics, nanophotonics, in batteries and fuel cells.
26. Use of the coated, finely particulate, inorganic solids produced by the process according to one of claims 1 to 23 for the production of a suspension or slurry with a solids content of 10 to 80 wt.%, in which the suspension may be based on water or on a non-aqueous solvent.
27. Use according to claim 26, characterised in that the solids content is 20 to 75 wt.%.
28. Use according to claim 26, characterised in that the solids content is 40 to 70 wt.%.
29. Use according to claim 26, characterised in that the solids content is 50 to 80 wt.%.